

650V N-Channel POWER MOSFET

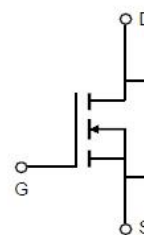
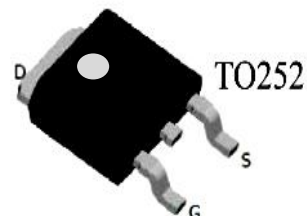
Features

- $V_{DSS}=650V$ $I_D=4A$
 $R_{DS(ON)}=2.8\Omega(\text{Max.})@V_{GS}=10V$
- High Reliability Capability with Passivation
- 100% avalanche tested
- RoHS compliant
- Low ON Resistance

Applications

- LED power supplies
- Cell Phone Charger
- Standby Power

PIN DESCRIPTION



Part Number	Package	Marking	ROHS Status	Packing
SI4N65D	TO-252	SI4N65D	Pb-Free	Box (Tube)

Absolute Maximum Ratings ($T_A=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Typical	Unit
V_{DSS}	Drain-Source Voltage	650	V
V_{GSS}	Gate-Source Voltage	± 30	V
I_D	Drain Current	4	A
	$T_C=25^\circ\text{C}$		
I_{DM}	Pulsed Drain Current	16	A
P_D	Power Dissipation (TC = 25°C)	30	W
I_{AR}	Avalanche Current	2.5	A
E_{AS}	Single Pulse Avalanche Energy	200	mJ
E_{AR}	Repetitive Avalanche Energy	116	mJ
T_J, T_{stg}	Operating Junction and Storage Temperature Range	-55 to 150	°C

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal resistance, junction – Case.	$R_{\theta JC}$	4.17	°C/W
Thermal resistance, junction – Ambient.	$R_{\theta JA}$	62	

Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

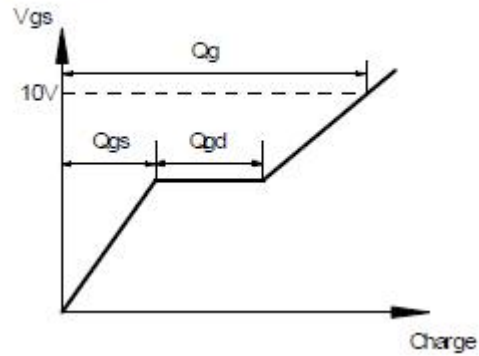
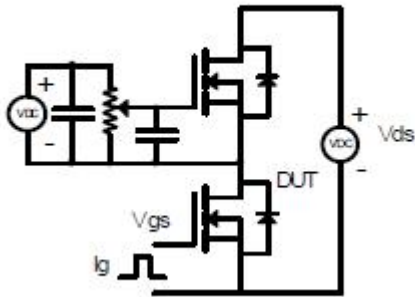
Symbol	Parameter	Test Conditions	Min	TYP	Max	Unit
Static Characteristics						
BV_{DSS}	Drain-source breakdown voltage	$V_{GS}=0V, I_D=250\mu A$	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=650V, V_{GS}=0V$	-	-	1	μA
I_{GSS}	Gate-Source Leakage	$V_{GS}=\pm 30V, V_{DS}=0V$	-	-	± 100	nA
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2	-	4	V
$R_{DS(on)}$	Drain-Source On-Resistance	$V_{GS}=10V, I_D=2A$	-	-	2.8	Ω
g_{fs}	Forward Transconductance	$V_{DS}=15V, I_D=2A$	-	3.5	-	S
Dynamic Characteristic						
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=25V, f=1MHz$	-	610	-	pF
C_{oss}	Output Capacitance		-	53	-	
C_{rss}	Reverse Transfer Capacitance		-	4	-	
Q_G	Gate Total Charge	$V_{DS}=520V, I_D=4A, V_{GS}=10V,$	-	15	-	nC
Q_{gs}	Gate-Source charge		-	3	-	
Q_{gd}	Gate-Drain charge		-	7	-	
$t_{d(on)}$	Turn-on delay time	$V_{DD}=325V, I_D=4A, R_G=10\Omega, V_{GS}=10V$	-	14	-	nS
t_r	Rise time		-	16	-	
$t_{d(off)}$	Turn-off delay time		-	32	-	
t_f	Fall time		-	11	-	
Drain-Source Body Diode Characteristics						
V_{SD}	Body Diode Forward Voltage	$V_{GS}=0V, I_F=1A$	-	-	14	V
t_{rr}	Body Diode Reverse Recovery Time	$V_{GS}=0V, I_F=4A, di_F/dt=100A/\mu s$	-	250	-	nS
Q_{rr}	Body Diode Reverse Recovery Charge		-	12.	-	μC
I_S	Maximum Continuous Drain-Source Diode Forward Current		-	-	4	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	16	A

Note:

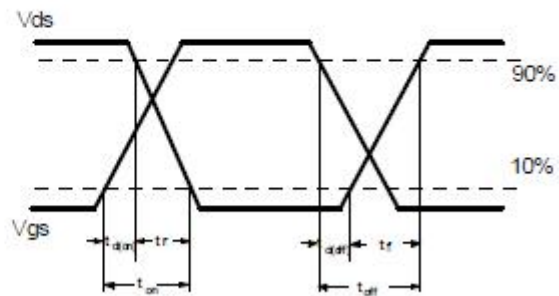
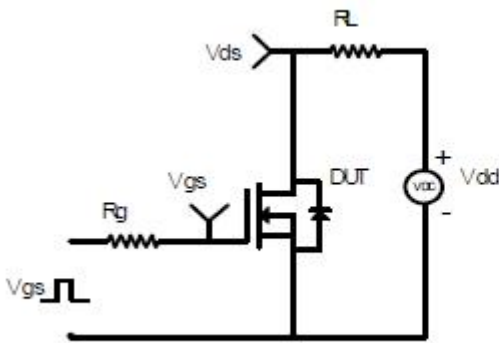
- The value of $R_{\theta JA}$ is measured with the device in a still air environment with $T_A=25^\circ\text{C}$.
- The static characteristics in Figures 1 to 6 are obtained using $<300\mu s$ pulses, duty cycle 2% max

Switching Time Test Circuit and Wave forms

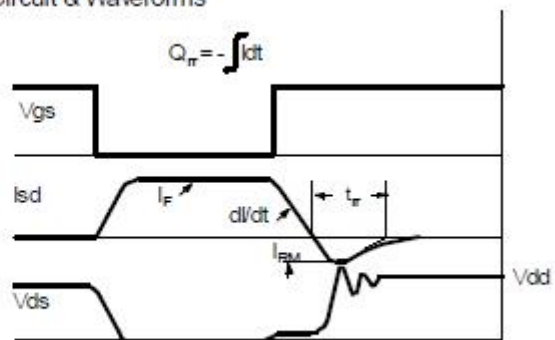
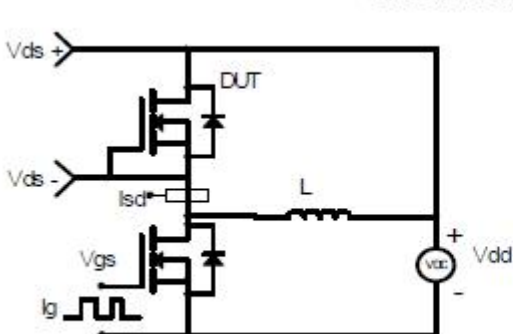
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Typical Performance Characteristics

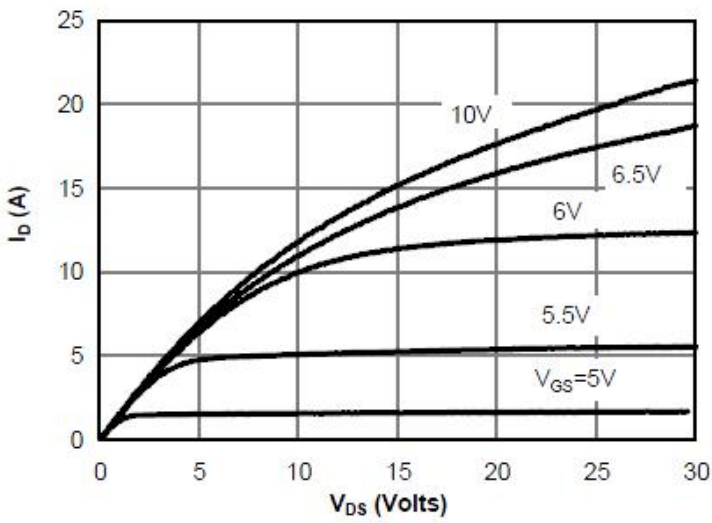


Fig 1: On-Region Characteristics

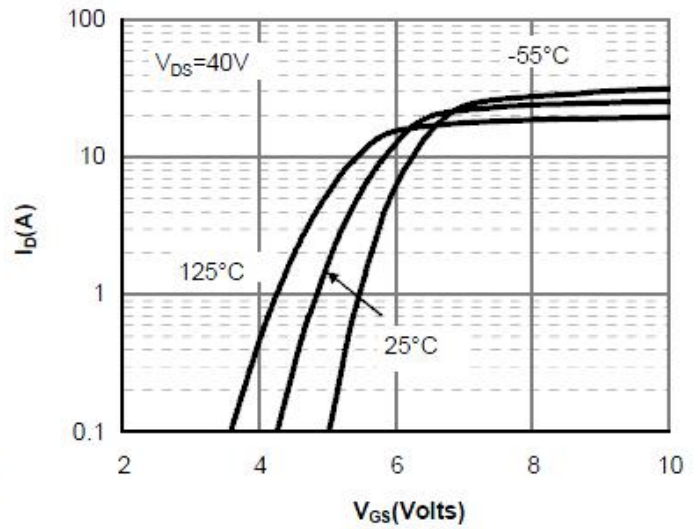


Figure 2: Transfer Characteristics

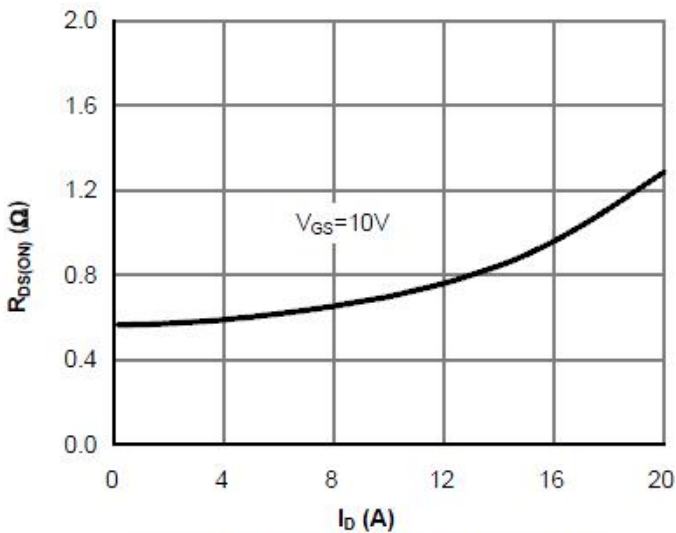


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

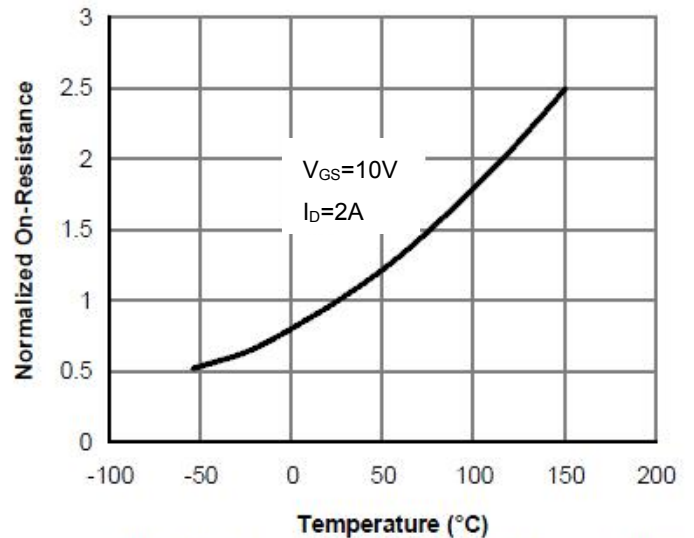


Figure 4: On-Resistance vs. Junction Temperature

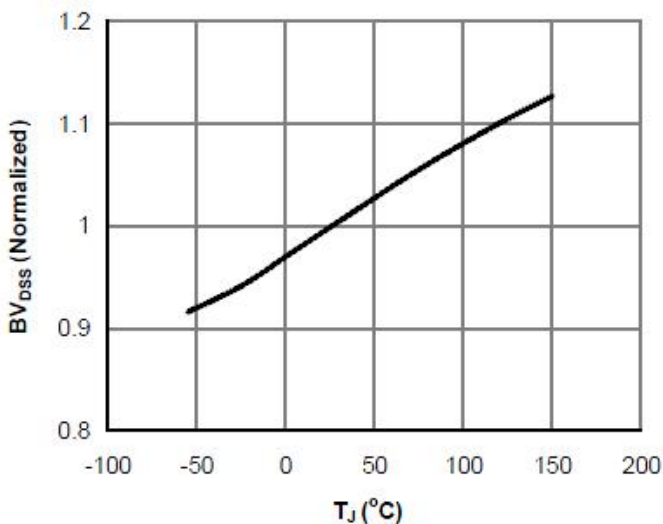


Figure 5: Break Down vs. Junction Temperature

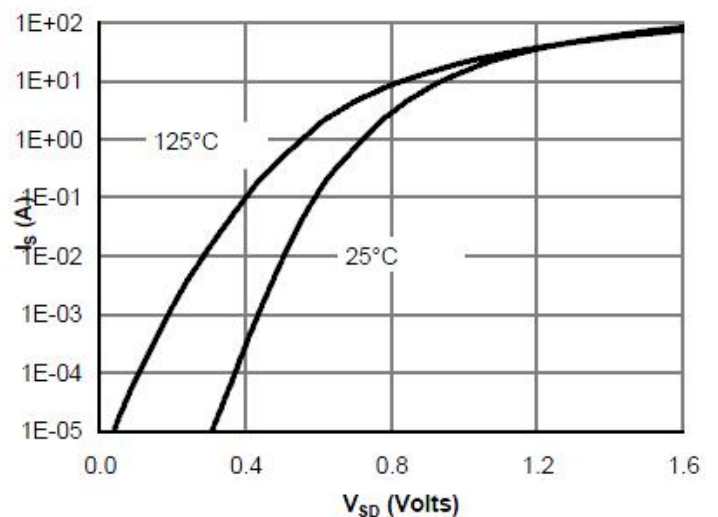
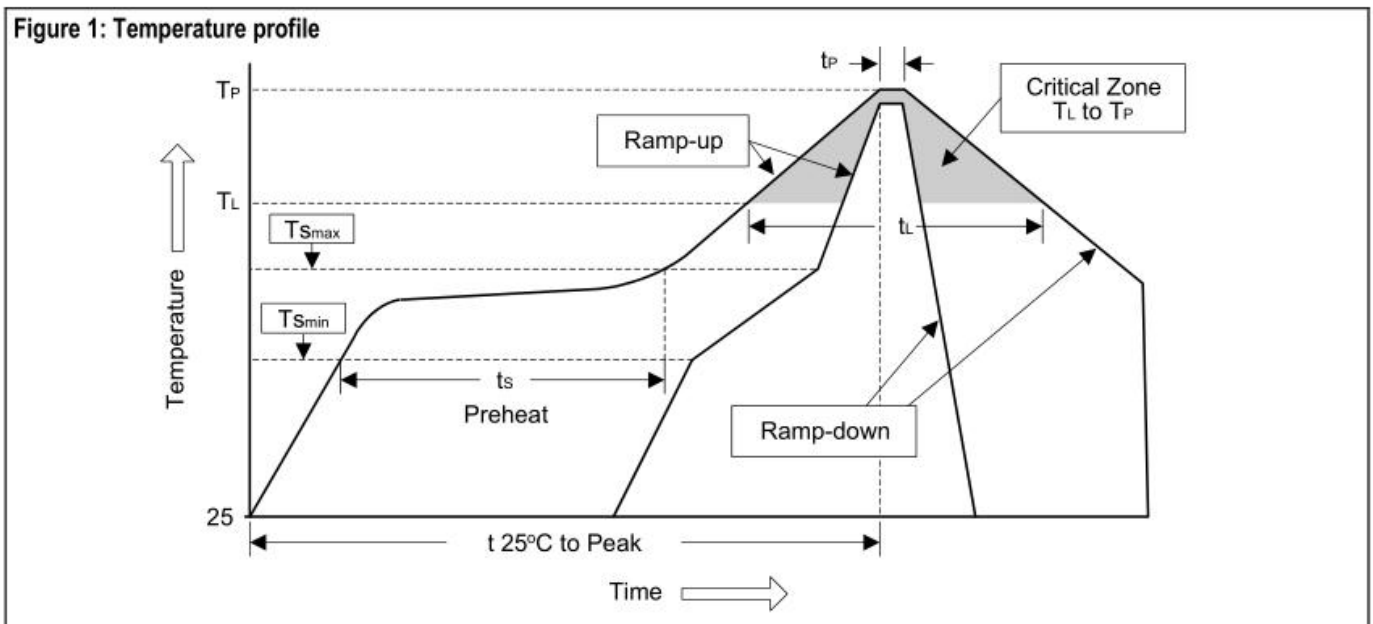


Figure 6: Body-Diode Characteristics (Note E)

Soldering Methods for Products

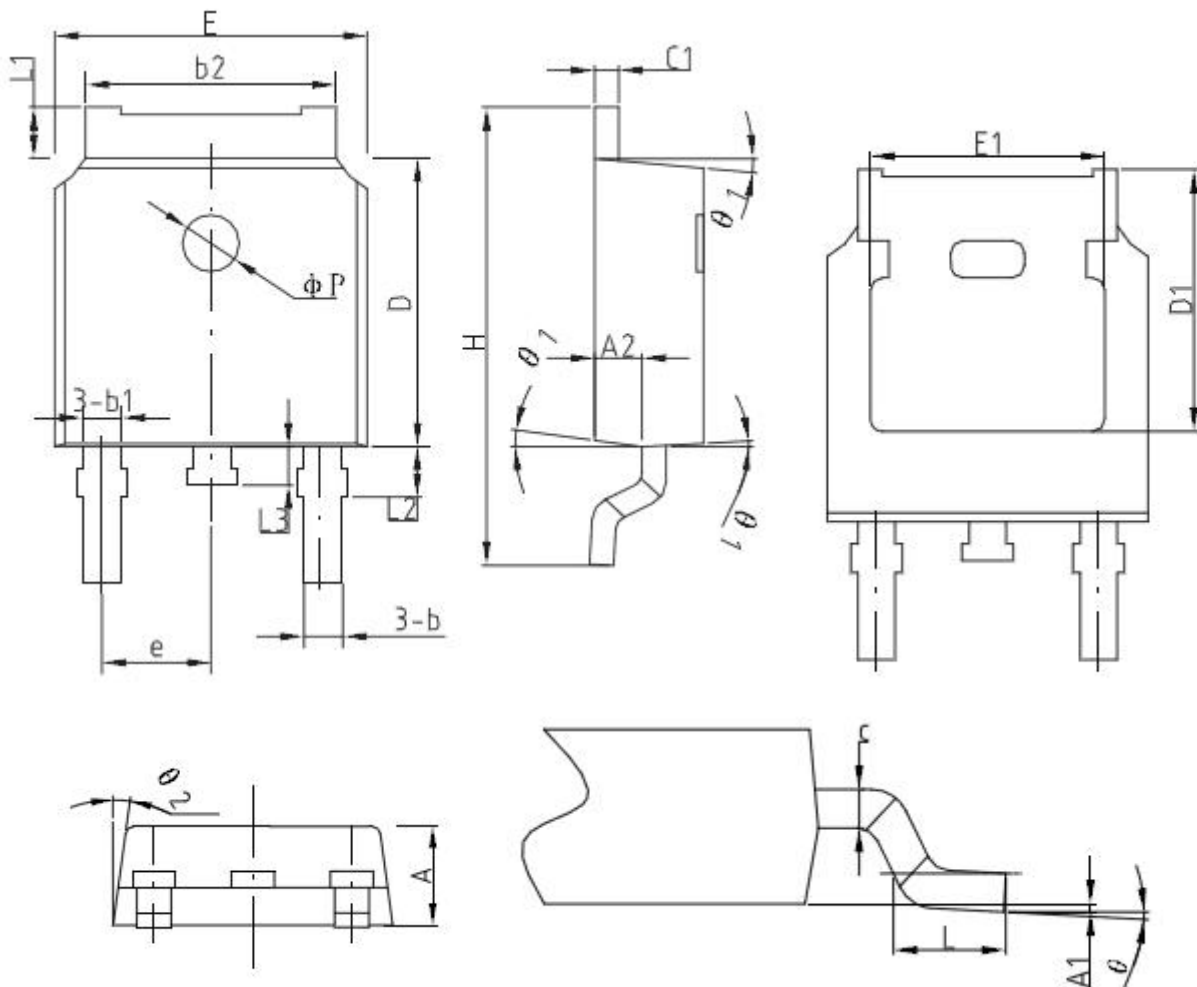
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate(TL to TP)	<3°C/sec	<3°C/sec
Preheat		
-Temperature Min(Ts min)	100°C	150°C
-Temperature Max(Ts max)	150°C	200°C
-Time(min to max)(ts)	60 to 120 sec	60 to 180 sec
Tsmax to TL		
- ramp-up rate	<3°C/sec	<3°C/sec
Time maintained above:		
-Temperature(TL)	183°C	217°C
-Time(tL)	60 to 150 sec	60 to 150 sec
Peak Temperature(Tp)	240°C+0/-5°C	250°C+0/-5°C
Time within 5°C of actual Peak Temperature	10 to 30 sec	20 to 40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25 °C to Peak Temperature	<6 minutes	<8 minutes



Note : 1.Storage environment: Temperature=10°C to 35@Humidity=45%±15%

- 2.Reflow soldering of surface-mount devices
- 3.Flow(wave) soldering(solder dipping)

Products	Peak Temperature	Dipping Time
Pb devices	245°C±5°C	5sec±1sec
Pb-free devices	250°C+0/-5°C	5sec±1sec

Package Outline


unit: mm					
Symbol	Min	Max	Symbol	Min	Max
A	2.2	2.38	E	6.50	6.70
A1	0	0.10	E1	4.80NOM	
A2	0.90	1.10	e	2.286BSC	
b	0.71	0.86	H	9.70	10.40
b1	0.76NOM		L	1.40	1.70
b2	5.13	5.46	L1	0.90	1.25
c	0.47	0.60	L2	1.05NOM	
C1	0.47	0.60	L3	0.8NOM	
D	6.0	6.20	φP	1.2NOM	
D1	5.30NOM		θ	0°	8°

■ Important Notice

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Any semiconductor under specific conditions are possible to certain failure or malfunction rate ; Customers are responsible in the use of Si-Trend products to system design and manufacturing in compliance with safety standards and adopting safety measures, To avoid the potential risk of failure may cause the personal safety and property loss。

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■ Modify record

Date	Version	Description	Pagination
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